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1991 Feature Article - Picking Turning Points in the Economy

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Introduction

At times, when the economy is suffering a downturn, there is heightened interest in picking up any signs of a turnaround. Picking a turning point in the economy as soon as possible after it has occurred is important as it allows prompt adjustment of policies in government, commerce and industry.

2. The purpose of this article is to outline the preferred ABS approach to estimating trends particularly at turning points. It also discusses shortcomings of alternate measures of trend behaviour that are commonly used. The properties of these different techniques are illustrated through their application to the series for quarterly growth in seasonally adjusted GDP(A) (footnote 1) and to the monthly unemployment rate.

3. Turning points in the economy are identified through the analysis of key economic indicator series such as employment, unemployment, gross domestic product (GDP), retail sales, building approvals etc, as well as composites of these series. A problem the analyst faces is the degree of variability inherent in the series. Some of this variability, eg seasonal factors and trading day factors, can be removed from the series by using seasonal adjustment techniques. However the series are likely to still contain a residual degree of variability, disguising the trend information the analyst is interested in extracting. For this reason it is common to apply smoothing techniques to the data to help identify the underlying direction of the series.

4. The performance of a smoothing technique in identifying turning points in an economic series can be assessed from two points of view. Firstly, from an historical perspective, there is the ability of the smoothing technique to establish the correct timing of past turning points. Secondly, there is the ability of the smoothing technique to quickly identify a new turning point in a series. Both these considerations are important. Wrongly identifying the timing of a past turning point for a series may lead to incorrect assessments of leads and lags in economic systems or misinterpreted cause and effect relationships. The benefit of quickly identifying current turning points in the series to ensure the responsive setting of appropriate policies, is clear.

5. This article discusses both these aspects of the performance of the smoothing procedures.

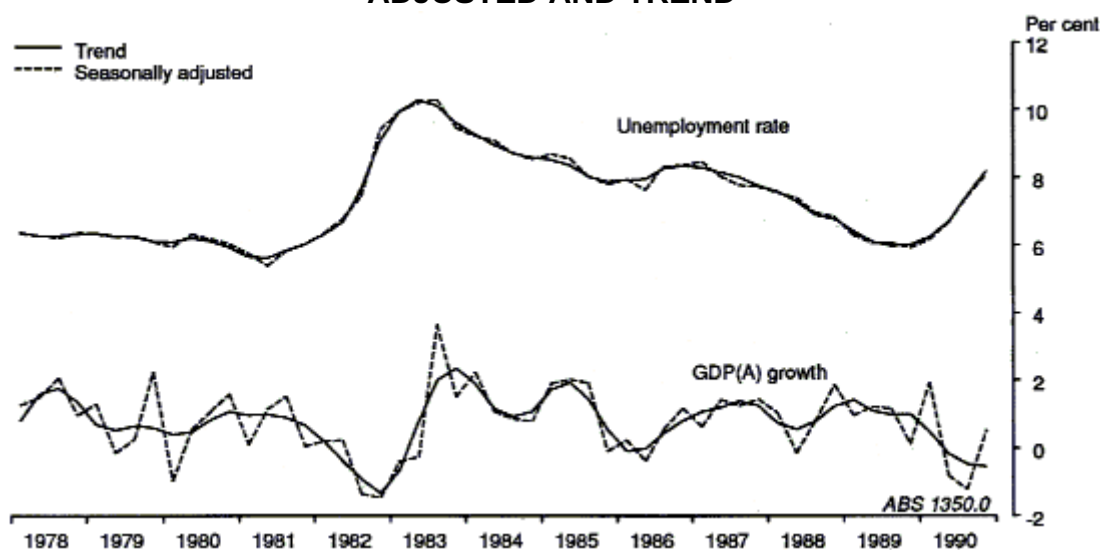
ABS Trend Estimates

6. The trend estimates released by the ABS are produced by smoothing the seasonally adjusted series using the statistical procedure discussed in **Information Paper cat. no. 1316.0: A Guide to Smoothing Time Series - Estimates of Trends**. The procedure is designed to minimise distortion of trend level, turning point shape and timing and is based on Henderson moving averages (footnote 2). It is important to note that these moving averages are centred on the point of time at which the trend is being estimated and thus there is no phase shift in the resulting smoothed series. Generally a 13 term Henderson moving average is applied to monthly series

and a seven term one to quarterly series.

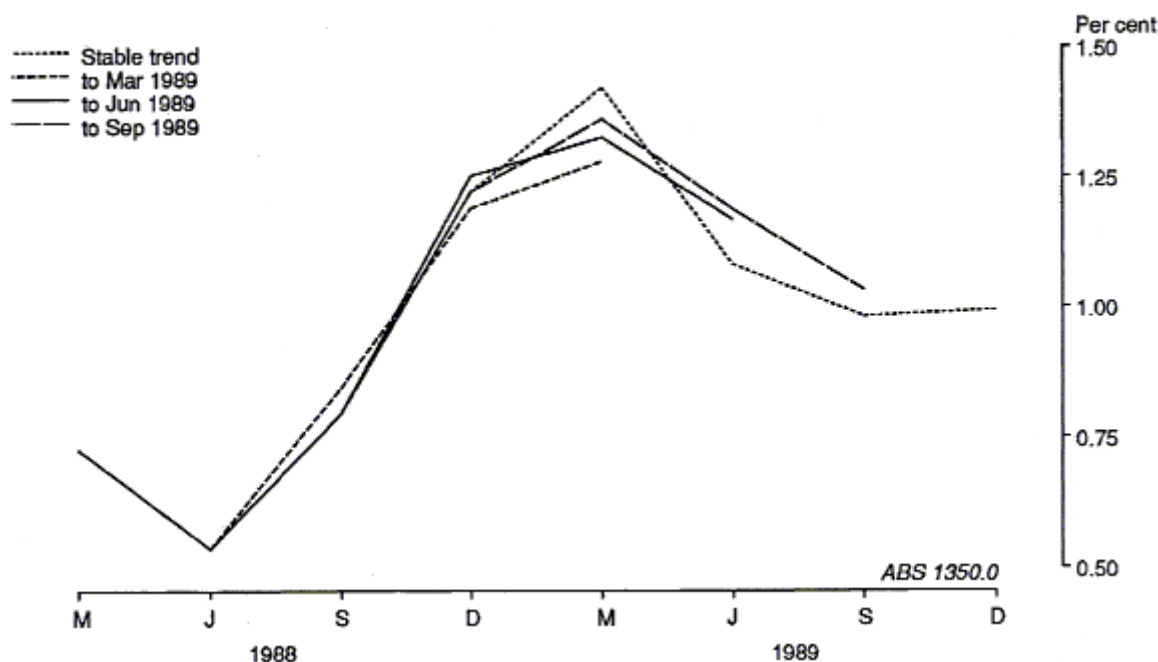
7. Graph 1 shows the trend series produced for growth in GDP(A) and the unemployment rate. From this graph it is clear that the **trend series tracks the seasonally adjusted series well**. However, a concern with the trend series lies with recent data points for which insufficient data exists to use centred moving averages. Here trend estimates are derived by using surrogate moving averages (not centred) that approximate the cycle dampening properties of the Henderson moving average (footnote 2). While some time phase shifting problems can occur with trend estimates for recent data points, experience has shown the problem to be minimal. **A more substantial problem is the extent of revision to the trend estimate as subsequent data becomes available, with the last three trend estimates being most prone to revision.**

GRAPH 1. QUARTERLY GDP(A) GROWTH AND UNEMPLOYMENT RATE, SEASONALLY ADJUSTED AND TREND



8. This revision problem at the end of the series leads to a question of how quickly the provisional trend estimates can pick up turning points in the economy. Graph 2 illustrates the situation for growth in GDP(A) in terms of the recent peak. From this graph it is clear that **the peak in growth in GDP(A) now identified as having been in March 1989, was detectable in June 1989, that is as soon as was possible.**

GRAPH 2. GDP(A) TREND GROWTH RATE TURNING POINT IDENTIFICATION



9. Table 1 shows the situation for the corresponding trough in the unemployment rate. The unemployment rate, now identified as having ceased falling in August 1989 and plateauing through to the end of 1989, also ceased falling in terms of the provisional trend estimate in August 1989. The plateau was measured through September and October but provisional trend estimates for November and December showed a slight decline which was later revised away. **From January 1990, both the provisional and stable trend estimates have shown the unemployment rate rising.**

TABLE 1. UNEMPLOYMENT RATE

Period	Seasonally adjusted	Provisional trend				Percentage change:		
		1st estimate	2nd estimate	3rd estimate	Previous month trend	Previous year seasonally adjusted	Pseudo- yearly growth seasonally adjusted	
								Trend (stable)
PER CENT								
1989								
January	6.9	6.7	6.9	6.8	6.7	-1.47	-9.21	-7.95
February	6.7	6.6	6.8	6.6	6.6	-1.49	-10.67	-11.50
March	6.3	6.4	6.6	6.4	6.4	-3.03	-16.00	-19.63
April	6.1	6.3	6.3	6.3	6.3	-1.56	-22.78	-22.27
May	6.2	6.2	6.2	6.1	6.3	-1.59	-16.22	-16.62
June	6.0	6.1	6.0	6.1	6.1	-1.61	-18.92	-19.36
July	6.1	6.0	6.0	6.0	6.0	-1.64	-10.29	-14.14
August	6.0	6.0	6.0	6.0	6.0	0.0	-15.49	-15.35
September	6.1	6.0	6.0	6.0	6.0	0.0	-12.86	-10.43
October	5.9	6.0	6.0	6.0	6.0	0.0	-13.24	-13.94
November	5.9	6.0	5.9	5.9	6.0	0.0	-11.94	-12.05
December	5.9	6.0	5.9	6.0	6.1	0.0	-14.49	-10.31
1990								
January	6.1	6.1	6.2	6.2	6.1	1.67	-11.59	-2.23
February	6.5	6.2	6.2	6.2	6.2	1.64	-2.99	12.16
March	6.1	6.2	6.2	6.2	6.2	0.0	-3.17	0.25
April	6.2	6.3	6.3	6.3	6.4	1.61	1.64	3.83

(a) : For example: at the time the 1st estimate for July 1989 was available, the 2nd estimate for June and the 3rd estimate for May were available, giving May to July figures of 6.3, 6.1 and 6.0 respectively. Source: The Labour Force, Australia (cat. no. 6202.0).

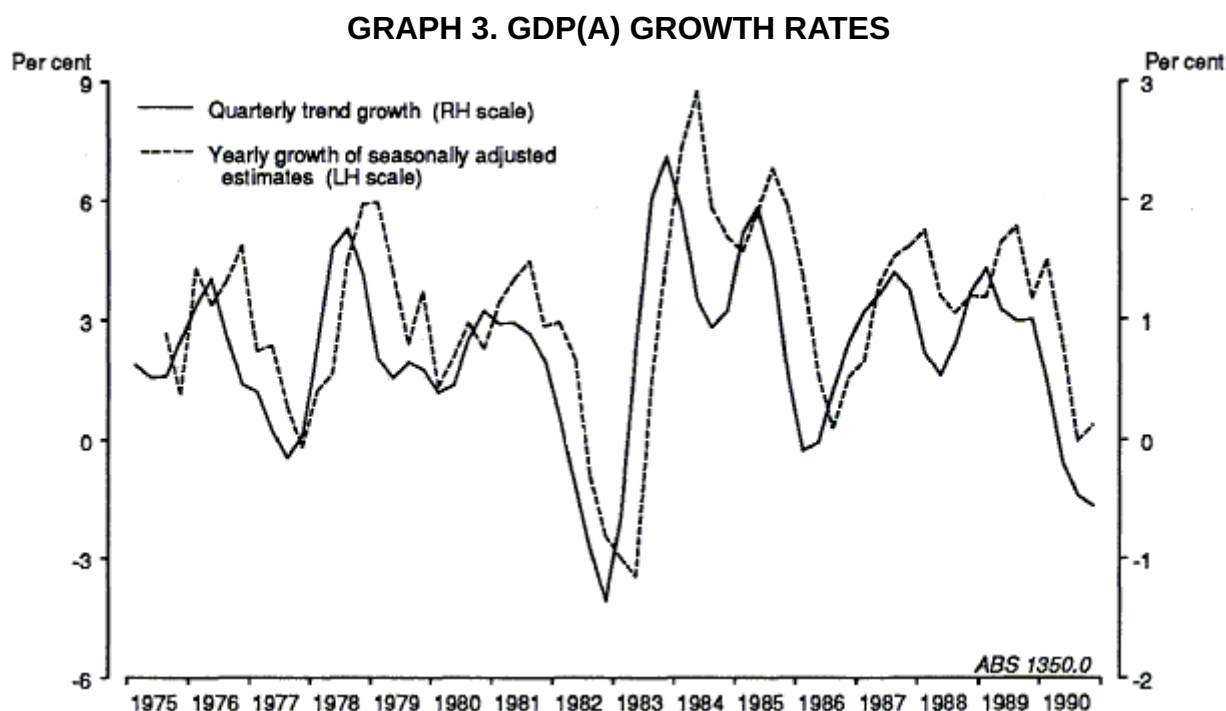
Yearly Growth Rates

10. Another means of smoothing time series often adopted by analysts in an attempt to determine underlying directions of series is the use of a growth rate measured over a time span considerably longer than the periodicity of the data. A common example of this is the percentage change from the corresponding month (quarter) of the previous year, hereafter referred to as **yearly growth**.

11 . The yearly growth rate is generally less volatile than the adjacent period to period movement. An additional feature, of some importance where seasonally adjusted data are not available, is that the yearly growth rate provides a crude adjustment for seasonal influences although it does not allow for trading day or moving holiday effects.

12. However, an undesirable feature of the yearly growth rate is that it **delays detection of turning points and can lead to misinterpretation of the timing of past turning points**.

13. Graph 3 compares the yearly growth of seasonally adjusted GDP(A) with that of the ABS quarterly trend growth. It can be seen that the quarterly trend growth measure discloses the growth peaks and troughs in Australia's production of real goods and services about six months before they are detected by the yearly growth measure. For instance, the quarterly growth indicator points to a peak growth in GDP(A) in March quarter 1989, with growth declining thereafter, whereas the yearly growth discloses a peak two quarters later in September 1989. A similar situation occurs with the trough in December quarter 1982. **Since September 1974 the quarterly trend growth measure has indicated peaks and troughs two or more quarters earlier than the yearly growth series in about seventy percent of cases.**



14. Table 1 shows a similar situation with regard to the unemployment rate. For instance, whereas the ABS monthly trend rate indicates the unemployment rate stopped falling in August 1989, **the yearly growth series places the turning point eight months later in April 1990.**

15. The delay in detecting turning points through the use of yearly growth rates is a result of the one year span being too broad and insensitive to monthly (or quarterly) growth reversals. For instance, a yearly growth can only become negative when the current observation is below its counterpart one year ago, but monthly trend movements may have been in decline for many months.

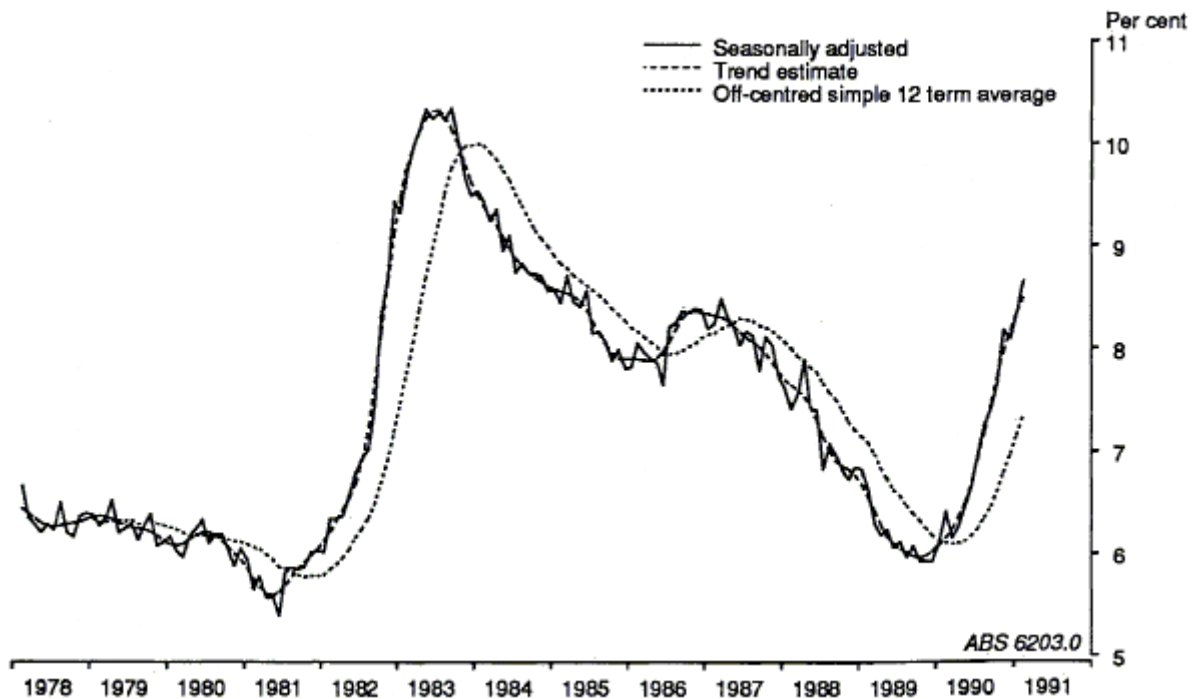
Other Smoothing Techniques Commonly Used in Turning Point Analysis

16. **Pseudo yearly growth rates:** In some cases pseudo yearly growth rates are computed by analysts. For example, if December is the current month, the growth rate is estimated as the ratio of the December figure to the average for the twelve months ended in November. Because the interval from December to the middle of this twelve month average is 6.5 months the ratio is raised to the $12/6.5$ power to convert it to an annual rate. The result, expressed as a percentage change at an annual rate, is attributed to December. A problem with this measure is that **any irregularity present in the current month is amplified** by the powering up of the growth rate. Also the averaging of the previous 12 months of data provides a very crude measure of trend behaviour. **Pseudo yearly growth rates are also slow to detect turning points. For instance, as shown in Table 1, when applied to unemployment this measure points to a cessation of the fall in the unemployment rate having occurred in February 1990, nearly half a year late.** Coincidentally, the amplification of short term volatility can also be seen in this month. Table 1 shows that the seasonally adjusted figure for February 1990 contains a relatively large upward irregular movement compared to the estimates immediately preceding and following. This short term volatility has led to the large 12.16 percent jump in the pseudo annual growth indicator.

17. **Off-centred moving averages:** The use of moving averages to smooth the seasonally adjusted series has the potential to proxy trend behaviour. However, in an effort to avoid the end point problem referred to in paragraph 7, analysts sometimes off-centre the result to the current end of the time series. For example, a three month moving average instead of being centred on the middle month, may be taken as indicative of the trend in the third month and the series plotted in this way. While this gives the **perception** of the availability of current information, it does **distort the series and results in phase shifts, with the timing of past turning points being miscalculated.**

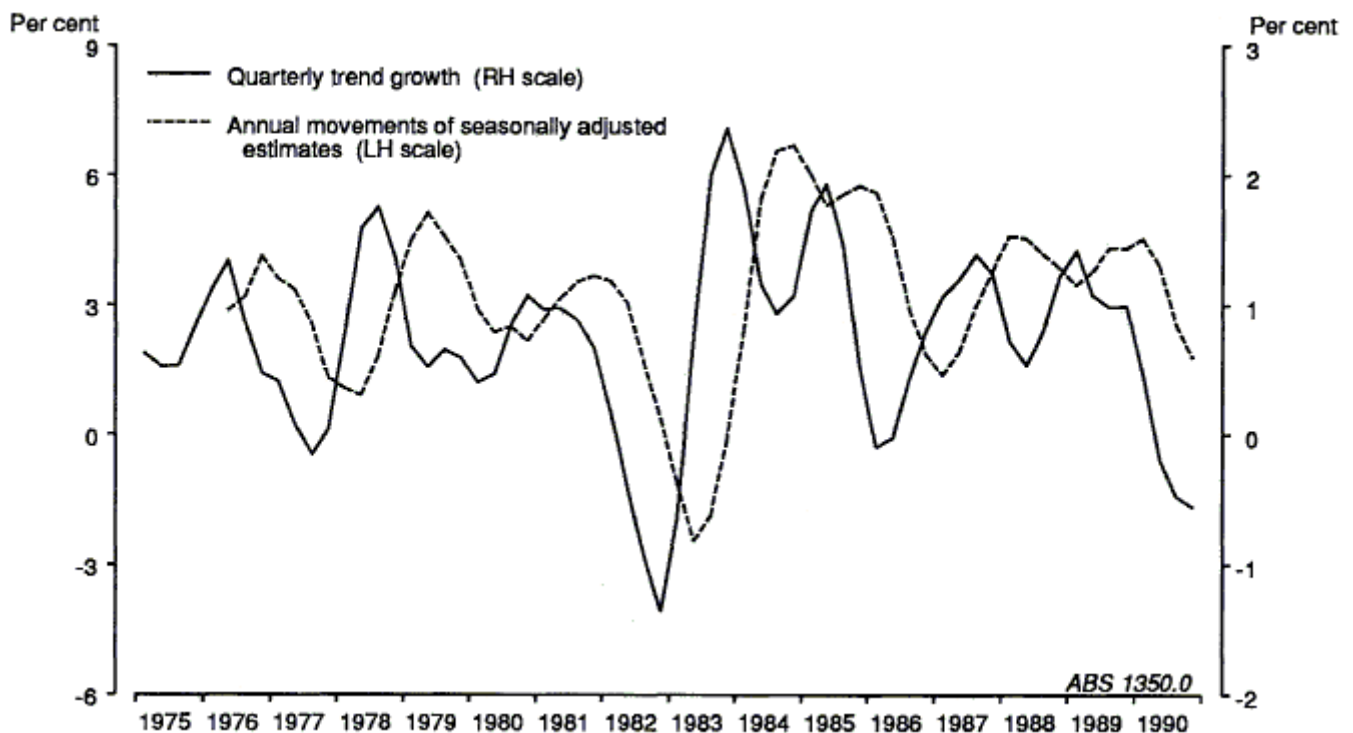
18. Graph 4 illustrates the degree of distortion that occurs when the seasonally adjusted unemployment rate is smoothed by taking the average over twelve consecutive months to represent the trend of the last month in that span. It can be seen that the trend unemployment rate commenced rising in July 1981 but using the off centred moving average, would not have been identified till March 1982. Similarly the rising of the trend unemployment rate in January 1990 was not indicated till June 1990. Yearly growth of this phase shifted measure fails to indicate a rise until September 1990. From Graph 4 some other deficiencies of using simple averages can be seen; they can mis-estimate trend levels (eg refer to 1983), the sharpness of the turning points (eg refer to 1981) and points of inflexion (eg refer to 1984-85).

GRAPH 4. UNEMPLOYMENT RATE, AUSTRALIA



19. **Annual movements:** Smoothing is sometimes achieved by the simple accumulation of data rather than averaging. For example annual movements of GDP(A) are sometimes derived by taking the sum of the latest four quarters GDP(A) over the sum of the previous four quarters on a moving quarter to quarter basis as shown in Graph 5. **The result is a delay in detecting turning points in the series if these movements are interpreted as representing current trend behaviour.**

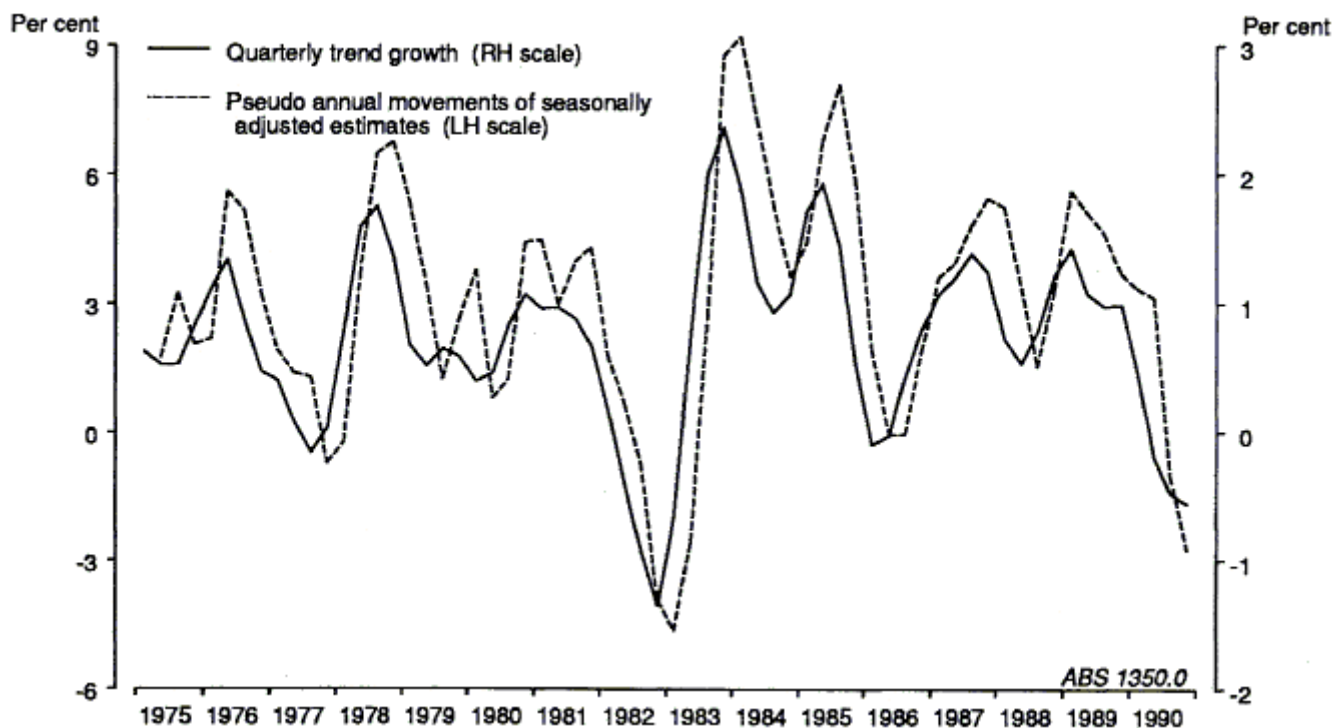
GRAPH 5. GDP(A) GROWTH RATES



20. **Pseudo annual movements:** These are computed by dividing the sum of the two most recent seasonally adjusted quarters by the sum of the two preceding ones, then annualising the movement by squaring the ratio and expressing it as a percentage change. Like the pseudo

yearly growth rate discussed above **the squaring of the change will accentuate any irregularity in either of the two periods and construing it to be a current trend indicator introduces a delay in detecting the trend turning points as shown in Graph 6**, although the delay is less than for pseudo yearly growth rates and annual movements.

GRAPH 6. GDP(A) GROWTH RATES



21. Year to Date movements: Another procedure similar to the annual accumulation method discussed above, is the use of the so called **year to date** measure as an indication of trend behaviour. Comments of the following type are commonly made: "However, as usual, given the normal volatility of these numbers it is better to look at the longer term trend. In the first seven months of this financial year, Australia's current account deficit was \$6,730 million, or \$2000 million lower than in the same period of 1986-87". The deficiency of the year to date measure is that **with each additional month of data the extent of smoothing implicit in the year to date accumulation varies, giving for each month a different form of trend estimate**. For example, smoothing three months of data gives a different proxy trend estimate to smoothing eleven months of data. Additionally, **different degrees of phase shifting occur when the analyst assumes the year to date growth represents the current trend performance**.

Conclusions

22. There are a wide variety of smoothing techniques in common use by analysts interested in picking underlying directions in volatile economic time series. This paper indicates some of the pitfalls associated with a number of these techniques and points to the need for care in their use.

23. From an historical perspective the trend estimates produced by the ABS have a number of desirable features in terms of accurately identifying trend turning points. The ABS's trend series do suffer however, the disadvantage of being subject to revision at the current end of the series but despite this they frequently perform well relative to other smoothing techniques in the early detection of turning points. In addition relatively sophisticated procedures are available for discerning the likely extent of revision to particular trend series (footnote 3).

24. At the current end of series it is recommended that, when available, the ABS's trend

movements be used in conjunction with, rather than instead of, the seasonally adjusted figures to provide analysts with the best picture of the recent underlying direction of the series.

25. The ABS trend approach can be applied to any non-seasonal or seasonally adjusted series. However, if trend estimates are not available, alternative techniques may need to be used. In this case analysts should be aware of their shortcomings as outlined above.

This feature article was contributed by Susan Linacre and John Zarb, ABS.

Footnotes

1. GDP(A) is the Gross Domestic Product average measure. It is the simple average of the Income, Expenditure and Production based GDP measures, at average 1984-85 prices. < Back

2. See cat. no. 1316.0 for details of Henderson moving averages and surrogate averages. < Back

3. Contact The Director, Time Series Analysis for further details. Telephone (02) 6252 5132. < Back

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